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BOLIVIA AND IT'S PATH TO BECOME THE ENERGY HEART OF SOUTH AMERICA

This article discusses some big changes that Bolivia has had in the energy sector since Evo Morales took power in 2006 and all the challenges and opportunities which now the country has trying to make Bolivia "the energy heart of south America".

Keywords: *bolivian energy sector; energy policy; renewable energy.*

Bolivia used to be one of the biggest headaches in South America, the country had a lot of problems and one of the biggest level of poverty in the region, but after years of bad economic management and a Capitalism of "Friends" in 2003, many sectors of society took off of his charge to the Ex-President Gonzalo Sanchez de Lozada. Bolivian people was basically so tired about the political order, and that is why they required institutional changes in the country, in other words they required that the state should have the main role in the economic, by nationalizing the main sectors of economy which were privatized in the 90s. It was not till 2006, when President Evo Morales took the crucial step by nationalizing the biggest company in Bolivia YPFB, since then the economic situation in Bolivia changed, and changed for good [1].

Some years ago the World Energy Council (WEC) [1] coined the concept of the Trilemma of Energy as a framework to establish the challenges at the level of the different countries in the use of renewable and nonrenewable resources. The Trilemma is basically supported on three dimensions: Energy Security, Social Equity and Mitigation of Environmental

Impact [2], by measuring aspects of energy supply, energy infrastructure, coverage, care of future demand, accessibility and affordability to energy, energy efficiency, energy sources, renewable and non-renewable energy and carbon emissions among other aspects that add to build a vision of energy sustainability in each country.

In the scope of analysis, we may indicate that, like many countries, Bolivia came to a turning point marked by imbalances that contributed to social aspects, environmental policy and natural resources that led to an important imbalance in the three dimensions of the Trilemma [2].

More than ten years later, we can observe that the differences in the dimensions of the Trilemma have reduced in a significant way. The average investment in the energy sector, without regard to Oil and Gas, has increased in 4.3 times, reaching the amount of 114.3 MM\$/year; generation was added to 642 MW of power for a domestic market that demand 1,300 MW [3]. The same is observed in the transmission and distribution systems, allowing with this to achieve results that are highly relevant in the coverage and access of electricity, such as the department of Santa Cruz, which consumed 36 % of energy, achieving an electrification coverage of more than 90 % of the population, a phenomenon that is starting to see in other populations with coverages up to 80 %.

The growth of consumption and the rates of development of the Bolivian economy is above 5 % and higher than the average in the region. The government of Morales decided to lead new policies and look forward to further coverage that pointed to the expansion and security of supply of the electrical system, then fall into a deficit of supply in 2011, which affected reserves and gave rise to rolling blackouts on several occasions [4].

The great impulse and response was given with the incorporation of power plants taking advantage of the domestic production of natural gas with lower delivery time and costs, that to date represents the 69 % of the electricity generation following hydroelectric with a 30 % and 1 % of alternative energies, raising with this the possibility of duplicate generation

systems in more than 1,000 MW by 2020, on the basis of potential agreements with neighboring countries such as Argentina or Brazil [4].

Through the nationalization of the electric sector, with the state company ENDE and its subsidiaries, the State became the protagonist and responsible for the supply, induced also by the low subsidized prices of electricity, one of the lowest in Latin America (0,09\$/kWh residential) after Argentina and Venezuela. This made it very difficult to run large investments with rates of return appropriate for the risks associated with new projects [2].

The incursion of a country such as Bolivia in the diversification of its energy matrix with alternative projects should not be surprising. Consider the great diversity of microclimates and natural energy resources with that account beyond the natural gas. Only hydropower is estimated a potential of more than 40,000 MW, and converting this into an opportunity that begins to translate with the implementation of innovative projects of power generation from wind, solar and geothermal energy in different scales, both to provide energy to remote regions of the backbone system, for example, the project of the 5 MW photovoltaic solar plant in Cobija, as well as to increase the power with geothermal projects, such as the Laguna Colorada, which can provide 50 MW [3].

However, it will be a great challenge to make profitable the economic results of the projects with renewable energies, compared with the generation costs of other energy sources such as natural gas or hydropower. In the situation of subsidized prices, natural gas for generation is marketed in the order of 1.3 \$/MMBtu, so that the solar or wind generation projects lose competitiveness to investment that must be run in the 600 \$/kW installed [2].

Taking into account this reality, the Government promoted [4] last year a couple of decrees of incentives to the alternative energy and has been examining two draft laws for the development of the electricity sector and the use of alternative energies, what will promote policies, standards and funding mechanisms that will help to build this second level opportunities and offer local energy with exportable potential.

While being aware of the energy supplies in the neighboring countries, the government believes Bolivia has a great potential and now takes all the necessary steps to increase and diversify energy production in the region. At present, the Bolivian government is focused on expanding the energy mix of the country in order to generate and export the excess electricity to Brazil and Argentina. At the same time, Bolivia is working on developing alternative and more ecological ways of producing electricity. It also has vast reserves of natural gas that significantly increases its role on the international stage [3].

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